



PALMÆ MALESICÆ

V.—Notes on Some Malayan *Dæmonorops*

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This paper embodies the notes I have made on some doubtful, rare, imperfectly known, or new species of *Daemonorops* of the section PIPTOSPATHÆ represented in the Singapore and the Kepong* herbaria. The following seven are described as new species or varieties: (a) *D. brachystachys*, *D. Kunstleri* var. *langkawiensis* and *D. pseudo-mirabilis* var. *malayanus* from the Malay Peninsula; (b) *D. calothyrsus* and *D. longipedunculatus* from Borneo; (c) *D. lasiospathus* from the Malay Peninsula and Borneo; and (d) *D. confusus* from Sumatra. Owing to the scanty material available of *D. propinquus* from the Peninsula, Beccari based his specific description on more than one specimen. It is shown that not all the specimens utilised in the description belong to this species, and that Ridley had at one time included under *D. propinquus* specimens belonging to *D. leptopus* (cf. synonymy and remarks under *D. brachystachys*, *D. confusus*, *D. micracanthus* and *D. didymophyllus*). *D. propinquus*, as defined here, is purely a peninsular species; the Sumatran material referred to this species is apparently *D. confusus*. As a result of good herbarium specimens collected by the personnel of the Forest Research Institute, Kepong, I have been able to reduce *D. draconcellus* to *D. micracanthus*, thereby extending the range of the latter to Borneo. Apparently this is the species that produces the best "Dragon-Blood" of commerce both in the Peninsula as well as in Borneo. Of the four peninsular species belonging to the sub-section RESINIFERÆ, *D. brachystachys* appears to be the most scarce, while *D. micracanthus* and *D. didymophyllus* the most frequent. The last-mentioned was regarded as endemic in the Peninsula, but it is shown here to occur also in Borneo. It was confused by Merrill with *D. periacanthus* Miq., a non-resiniferous species. The Bornean species *D. sparsiflorus* and its var.

* I am indebted to the Director of the Forest Research Institute, Kepong, Malay Peninsula, for the loan of the material.

sarawakensis do not belong to the RESINIFERAE, among which it was placed by Beccari. *D. verticillaris* is shown to be a species endemic in the Peninsula, previous records for its occurrence in Borneo being based apparently on misidentified specimens of *D. acamptostachys*, a species that appears to be very akin to *D. floridus*. What appears to be *D. annulatus*—a species hitherto known only from Borneo—has been found to be abundant along the banks of Sungei Kayu Ara in Johore, but both the Bornean and the Peninsular material so far collected lack reproductive parts to enable one to decide the status or the affinities of the species. The typical *D. elongatus* (a Bornean species) has not been found in the Peninsula, all the peninsular specimens that were previously referred to this being either *D. Kunstleri* or its var. *langkawiensis*. The latter is a very variable species with regard to the number of longitudinal rows into which the scales are arranged on the fruits. A similar variation is also noticed in *D. vagans*, which is possibly a senile form of *D. Kunstleri*. It is shown that Ridley's record for *D. scapigerus* in the Peninsula is erroneous, though a species very like it occurs both in Borneo and the Peninsula (*D. lasiospathus*). A form of *D. longipes* occurs in Borneo (see my remarks under *D. longipedunculatus*). There is a great deal of variation in this species (*D. longipes*) and so it appears to me that a thorough revision of all the species belonging to its group is badly needed in order to see whether the various forms akin to it should be separated as distinct species or lumped together under *D. longipes* as mere ecologic or varietal forms. For a thorough revision of this group, a series of material specially from the Liu Kiu Islands, Borneo, Bangka, Philippines, etc. will be needed. A similar revision is also due of the group represented by *D. elongatus* and *D. Kunstleri* as well as of the one represented by *D. oblongus*, *D. Korthalsii* and *D. hystrix*. I have shown here that it is advisable to keep *D. oligophyllus* separate from *D. sabut* (to which Ridley had reduced the former) until fertile material is found. At present the two species are known from the infertile material only and one notices important distinctions between these two. That they appear to be closely related was noticed by their author himself (Beccari, l.c. 1911, p. 181–183). *D. ruptilis* which was described from a specimen collected by Low in an unknown place in Borneo has been found again by Elmer at Tawao in British North Borneo. *D. setigerus* is shown to be an

illegal* binomial based on a mixture of specimens belonging to more than one species.

As said above, all the species treated in this paper belong to the section PIPTOSPETHÆ as defined by Beccari in the *Annals of the Royal Botanic Gardens, Calcutta* (cited hereafter as *Calcutta Annals* or merely *Calc. Ann.*) XII, 1911. I am not sure that the two sections, CYMBOSPETHÆ and PIPTOSPETHÆ, into which Beccari has divided the genus are very natural; for the specimens of the first section having a long peduncle (e.g. *D. imbellis* and *D. Scortechinii*) are separated with difficulty from the species of the second section having a very much abbreviated fertile part (e.g. *D. lasiospathus*, *D. scapigerus* and *D. brachystachys*). Further Beccari has subdivided the section PIPTOSPETHÆ in a way that the species like *D. geniculatus* and *D. verticillaris*, which have a long external spathe enclosing, before anthesis, the entire inflorescence including the subprimary spathes, are placed very far apart from the ones which have similar outermost "universal" spathes simply because these latter are not provided with annular rings or collars on their leaf-sheaths (e.g. *D. Sarasinorum*). Further, these species having the "universal" spathes much longer than the internal ones resemble in their spathe characters some of those now placed under CYMBOSPETHÆ (e.g. *D. melanochaetes* and *D. Jenkinsianus*). By drawing the attention of readers to these facts I do not wish it to be understood that I am in disagreement with the sections and the subsections into which the genus *Daemonorops* has been divided. Beccari had to do the best with the scanty material placed at his disposal by the various herbaria to which he

* I use the word illegal on purpose; for the name is valid in the sense that it will have to be listed in such books as *Index Kewensis* and that its publication has once for all prevented making its legal use for any other species. (e.g. A homonym is a valid binomial, though illegal). An invalid name, on the other hand, is such that no botanist need take any notice of it and does not preclude one from making valid and legal use of it for a new species. (In this category come all *nomina nuda* and all binomials that after 1935 are published without any diagnosis in Latin. They should not be listed in *Index Kewensis*). Now the question comes whether one could legally use the trivial name of a valid, but illegal, binomial in a new combination when the binomial is the oldest validly published name for a species, and when the new combination does not produce either a new homonym or a duplication of the generic name? Formerly strict supporters of the priority rule adopted the trivial names of a homonym if the latter was the oldest valid name for the species, but, nowadays owing to a tendency of confusing legality of a binomial with its validity, there are botanists who strongly object to the use of trivial names of valid homonyms in making new combination, whether the homonyms have a priority claim or not. There is therefore a need for definite legislative measures to make this point quite clear and not a matter for individual opinion.

had appealed for specimens, and great credit is due him for restoring order where previously there was nothing but chaos and confusion. But as said in my previous paper (*Gard. Bull.* VIII, p. 242-243) there is a great need for making more perfect specimens than the ones previously made, and it is to prove the necessity of this that I have pointed out what appear to be flaws in the sections and the subsections of the genus *Daemonorops*, since it is only a study based on a series of good specimens that can throw further light on this matter. In addition to the usual parts, it is absolutely necessary that collectors make it a point to include in the specimens of *Daemonorops* the leaf-sheath (possibly the entire sheath when it is armed with annular rings) and the outermost spathe which falls off easily at the time of anthesis of the inflorescence. Should forest departments depute properly instructed collectors to the places where coupes are being felled or openings are being made in a forest for the purpose of road-construction or of extraction of certain commercial timbers, much valuable material can be collected which otherwise is obtained with great difficulty; for the long climbing rattans usually flower and fruit when they reach the tops of tall trees, and in a thick forest it is often not possible to bring down a rattan without felling several trees.

1. *Daemonorops acamptostachys* Becc. in *Calc. Ann.* XII (1911) 209 pl. 96.

D. verticillaris Mart. *sensu* Ridl. *Mat. Fl. Malay. Pen.* II (1907) 186 et *Fl. Malay. Penin.* V (1925) 45 quoad specimina borneensia; Merr. *Bibliogr. Enum. Bornean Pl.* (1921) 82 *syn. nov.*

BORNEO: **female:** Matang (Ridley, 12395, the Type); Kuching (Ridley, 12409; Shelford, vern. name *Daun Wi*). **Male:** Sarawak (Shelford, male and female mounted on the same sheet); Kuching (Hewitt; Sahib).

The species appears to be erect or semi-scandent, for, though the leaf-rachis bears strong, stout digitate claws on the dorsal side, the cirrus is small or rudimentary. Ridley's n. 12409 is accompanied by a petiole of a radical leaf which indicates that this rattan is tufted. The petiole is fugaceously furfuraceous and armed along the margins with long solitary or digitate spines. The primary spathes are narrowly lanceolate-cymbiform, acuminate, unicarinate, covered with deciduous rusty scurf on the outside, the lower spathes being scantily armed along the carina with solitary, distant, slender spines. The male flowers are pectinate as in *D. geniculatus* and *D. verticillaris*, a probable reason why Ridley confused this species with *D. verticillaris* and extended the distribution of the latter from the Malay

Peninsula to Borneo. The fruiting perianth is explanate but it withers away gradually until a small callosity (1–2 mm. long) remains on the fruit. The fruit scales are arranged in 15 vertical rows.

In the female flowers of one spadix in a duplicate of the type preserved in the Singapore Herbarium (Ridley 12395), the spathelets are unusually enlarged so as to obscure the length of involucrophores. But another spadix from the same collection and the one collected by Shelford both show that this enlargement of the spathelets is not normal and that the involucrophore could be much longer than hitherto described. This fact and the close resemblance of the leaflets of *D. acamptostachys* to those of *D. floridus* incline me to suspect that the latter species may be conspecific with the former. No doubt in *D. floridus* the leaflets are described as being grouped, but Beccari stated this after seeing only a terminal portion of a leaf. It is a known fact that in many leaves which have equidistant or subequidistant leaflets, but which end in a long cirrus, the leaflets become so disarranged in the terminal parts of the leaves as to give a mistaken impression that they are also so arranged in the lower parts of the lamina; and the terminal portions of the leaves of *D. acamptostachys* there is also a tendency for the leaflets to become disarranged. The only thing that makes one want to see more specimens of these two species before coming to a definite conclusion over the status of *D. floridus* is that its spadix is unusually long and that its leaves have a rather long cirrus.

2. ***Dæmonorops annulatus*** Becc. in Rec. Bot. Surv. Ind. II (1902) 227 et in Calc. Ann. XII (1911) 174 pl. 72.

MALAY PENINSULA: *Johore*, Sungei Kayu Ara, at 12½ mile Mawai-Jemaluang Road (Corner & Furtado, 29485; & 29486).

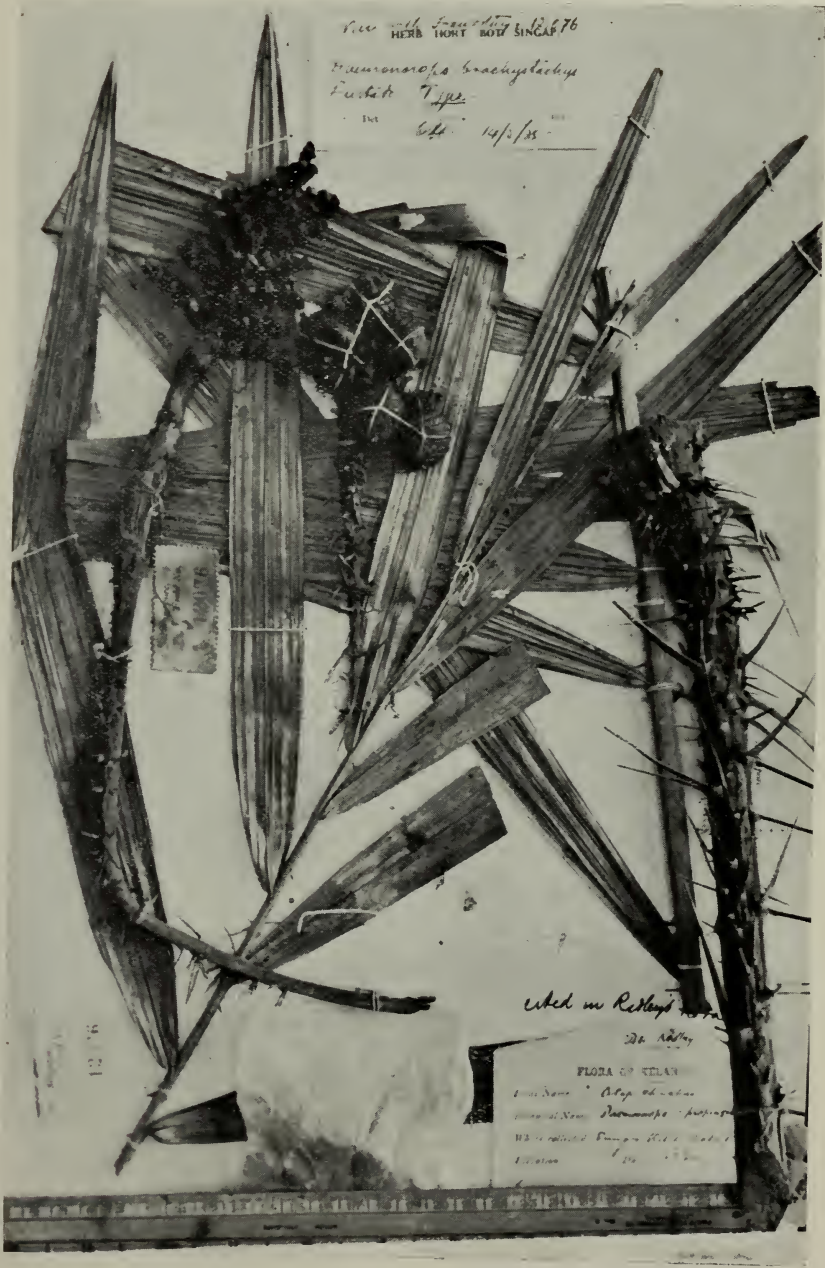
The above cited specimens (both taken from the same tuft to show the difference in the armature of the leaf sheaths of its juvenile and adult forms) appear to belong here, though the species has never been recorded before in the Peninsula, the type having been collected in Borneo. The younger stages are provided with long criniform bristles on the annular crests and resemble very much *D. mirabilis* var. *oligocyclis* Becc., a variety described from a specimen cultivated in Buitenzorg Botanical Gardens. The species grows in tufts and is very frequent in the dense forests along the Sungei Kayu Ara, though not a single plant was noticed with flowers or fruits.

3. *Dæmonorops brachystachys* Furtado spec. nov.

D. propinquus Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 467 quoad fructus ac foliola in nota (?); Ridl. Mat. Fl. Malay Pen. II (1907) 181 quoad specimen a Wrayio sub n. 3658 lectum, et Fl. Mal. Pen. V (1925) 41 quoad specimen kelantanense infra citatum. **Plate 37.**

*Caude*x scandens vel semi-scandens, robustus. Frondium *vagina* partim tantum visa, modo petioli armata ut videtur. *Peti*olus (frondium radicalium?) elongatus, 20 cm. superans, aculeis magnitudine variabilibus præditus; maximis ad 7 cm. longis, basi 4 mm. latis, apice acutis, subulatis, minimis 1 cm. longis vel interdum brevioribus, inter alteros sitis, deciduis (?), criniformibus; omnibus solitariis, perraro basi confluentibus. *Lamina* in cirrhum brevem vel rudimentarium terminata, secus rhacheos dorsum unguibus 1–3-fidis reflexis armata. *Segmenta* numerosa, inæquidistantia, alternantia vel sub-opposita, 4 cm. vel ultra inter se dissita, elliptico-lanceolata, sæpe apicem quam basin versus magis attenuata, maxime latitudine ad mediam vel infra sita, apice subito acuminata, subulata, basi abrupte contracta, plicatula, supra secus tres costas prominentissimas et subtus ad costam mediam remote spinulosa, 35–60 cm. longa, 3–5 cm. lata. *Spadix foemineus*: pedunculo ancipite 10–25 cm. longo, ad 1 cm. lato, 0.5 cm. crasso, secus margines et in latere superiore applanato aculeis digitatis vel non, ad 2 cm. longis valde armato, in latere inferiore convexo parcissime armato vel non; parte rhacheos terminali fructifera circ. 5–8 cm. longa; basali infertili ad 8 cm. longa; ambobus rhacheos partibus conjuncte pedunculo fere æquilongis vel brevioribus. *Rami* primarii 2, spiculiferi, spiculis ad 3 cm. longis, fructus ad 6 gerentibus. *Spathae* primariæ ignotæ; spathellæ annulares, apice in ligulam triangularem productæ. *Involucrophorum* breve, ex spathellis paulo exsertum; involucrum obeonicum, in cratera illius fere omnino immersum, apice prateriforme; areola latitudine sua æquilonga vel brevior. *Perianthium* fructiferum explanatum. *Fructus* oblongo-ellipticus, utrinque attenuatus, sine mucrone apicali ad 2 mm. alto et 3-fido 2.5 cm. longus, 1.8–2 cm. in diam., maxima latitudine ad mediam vel fere sita. *Squamæ* secus mediam canaliculatæ, per orthostichos 18–20 dispositæ, resina atrosanguinolenta profuse vernicatæ. *Semen* ovoideum, 1.5 cm. 1.3 cm. latum, 1.2 cm. crassum.

Planta mascula habitu sicut fœminea ut videtur. *Spadix masculus*: rhachis fertilis tantum visa, 40 cm. longa,



Dæmonorops brachystachys Furtado. Type.

in ramos 9, ad 7 cm. longos divisa; rami secundarii plures, graciles, spiculas numerosas gerentes; spicularum axis ramis secundariis similis, gracilior. *Corolla* 4 mm. longa, striata, calyce multoties longior.

MALAY PENINSULA: Female: *Kelantan*: Sungei Ketch at Batu Papan (Nur with Foxworthy, 12076, vern. name *Atap Chuchur*. Type in Singapore). *Perak*, Upper Perak at 300 feet alt. (Wray, 3658). **Male:** *Selangor*: Semenyih (Hume, 8113).

Leaflets in Wray's specimens are apparently from radical leaves.

This species appears to be related to *D. draco* as interpreted by Beccari in that the leaflets have three nerves bristly in the upper surface (the midrib only in its terminal portion) and the fruits are somewhat elliptic pyriform. The leaf-sheath and the petiole described above appear to belong to the basal leaves and hence are not comparable in any way to the corresponding parts of the leaves growing in the higher regions; but judging from the analogy in some other species studied by me, the normal leaf-sheath does not appear to belong to the class having deciduous, acicular spines which are one of the characteristics of *D. draco*. The Javanese species, *D. ruber*, which is also described to have 3 bristly nerves in the upper surface of the leaflets differs from this in its spherical and sparingly resiniferous fruits and longer spadices. *D. propinquus* which has been confused with this species has ovoid fruits which are much broader towards the base and have lighter coloured scales and resin. Its leaflets has only the median costa bristly above. (See also my remarks on *D. propinquus*).

4. *Dæmonorops calothyrsus* Furtado spec. nov.

D. longipedunculato infra descripto affinissima, sed aculeis ad vaginarum apicem longioribus ac pluribus; petiolis basin versus magis armatis, aculeis frequenter longioribus; spicularum rhachi crassiore; involucrophoris longioribus crassioribusque; fructibus longioribus, pro rata angustioribus, utrinque minus rotundatis, apice longius rostratis; squamis per orthostichos 12 dispositis hæc species bene distincta.

Caudex scandens vel semi-scandens, ad 6 m. longus. *Frondes* longipetiolatæ, cirrhiferæ, cum petiolo cirrhoque 1.5–4 m. longæ, dorso secus rhachen unguiculatæ. *Vagina* haud gibosa, ut in *D. longipedunculato* armata sed aculeis præsertim ad apicem sæpius longioribus, ad 10 cm. longis. *Segmenta* per greges utrinsecus 8–12, sub-oppositos

vel alternantes, singulos ex 2-5 constatos approximata, 35-45 cm. longa, 3 cm. lata, subtus ad costam mediam remote spinulosa, supra inermia vel in quarta parte terminali ad eandem costam remotius aculeolata, secus margines spinulosa, venulis transversis conspicuis. *Spadix foemineus* (sine pedunculo ?) 40-50 cm. longus; pedunculo ancipiti; ramis primariis 3-5, spiculiferis, 15-18 cm. longis; spiculis axi sinuosis, ad 8 cm. longis, tomentosis flores utrinsecus 5-6 gerentibus. *Involucrophorum* floriferum ad 2-4 mm. longum; fructiferum 5-7 mm. longum, cum involucro perianthioque 10 mm. longum. *Fructus* cum perianthio cyathiforme-campanulato 2-3 mm. et rostello 2.5-4 mm. alto 26-28 mm. longus, 12-13 mm. in diam; squamis per orthostichos 12 loricatis. *Semen* 16 mm. altum, 8-9 mm. latum, 7-8 mm. crassum; embryo subbasilari.

Spadix masculus paniculatus, decidue fusco-furfureus; pedunculo longo, ancipiti. *Spathae* primariae papyraceae, exsuccae, cinnamomeae, extus furfureo fugaceo fuscae, inermes; externa longissima, acuminata, bicarinata; spathellae annulares. *Rami*: primarii circ. 20 cm. longi; secundarii 6-7 cm. longi, spiculiferi; *Spiculae* 2-4 cm. longae, axi sinuosae, floribus untrinsecus 3-6.

BRITISH NORTH BORNEO: Kinabalu Mountains at Tenompok, alt. 4,000-5,000 feet (legit Furtado, comm. Clemens sub. n. 29194, female, Type in Singapore; and n. 29193, male).

Found growing in secondary jungle. My field notes say that the spadix is 40-50 cm. long, but I am not sure whether the peduncle was included in the measurements.

The species is at once distinguished from all the others belonging to *D. longipes* group by its fruits, which are, even in their younger stages, long and narrow, having their fruit-scales in 12 rows. The leaflets are almost bare above except for a small terminal portion which is spinulose along the midrib.

D. sabensis (collected in the lower regions of the Kinabalu Mountains) which from the description appears to belong also to this group, is said to have a very short petiole and a male inflorescence with funnel-shaped spathe and with the male flowers arranged as in *D. longispathus* and not as in *D. longipes*. The leaflets are described to be sparingly armed along the three nerves beneath. (The female plant is unknown).

From *D. periacanthus* it is easily distinguished by its unarmed (or occasionally sparingly armed) peduncle, fruits which are nearly twice as long as broad (not spherical),



Dæmonorops confusus Furtado. Type.

fruit-scales arranged in 12 (not 15–16) vertical series, by its leaf-sheaths which show no gibbosity below the petiole and which have very few small laminar or criniform bristles, and by its leaflets which have a midrib usually armed for the greater part in the lower, and only a small terminal portion in the upper, surface.

5. *Dæmonorops confusus* Furtado spec. nov.

D. propinquus Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 467 et in Calc. Ann. XII (1911) 111 quoad specimen sumatrense a Forbesio lectum et in Tabula 45 depictum?

D. draco Willd. *sensu* Bl. Rumphia (1845) quoad tab. 132? **Plate 38.**

Caudex scandens, robustus, cum vagina 2.5–3.5 cm. in diam. ut videtur. *Frondis vagina* infra petiolum gibbosa, aculeis inæqualitatis: longissimis paucis, robustis, ad 3 cm. longis, elasticis, plus minusve deflexis, laminaribus, sæpe laciniatis, plerumque solitariis, e basi latis apicem versus angustatis, summo subulatis; alteris multototies brevioribus, consimilibus, plurimis, inter priores positus, solitariis vel interdum confluentibus armatissima. *Petiolus* supra applannatus, aculeis ad 1.5 cm. longis, solitariis vel basin versus transverse confluentibus armatus, subtus convexus, aculeis paucioribus plerumque solitariis. *Lamina* magna, in cirrhum longum unguibus ad 7-fidis armatum transiens; ad rhacheos dorsum unguibus 1–3-fidis, reflexis prædita, supra parce aculeolata. *Segmenta* numerosa, subæquidistantia, alternantia vel subopposita, in parte terminali in greges ex segmentis binis vel pluribus sæpe approximata, plicatula, elliptico-lanceolata, utrinque subito attenuata, secus costam mediam utrinque parce aculeolata, subtus pallidiora, secus margines spinulosa, apice longe acuta vel acuminata, setosa, venis transversis indistinctis, 2–3.5, interdum 5.5 cm. inter se dissita, 25–35 cm. longa, 2 cm. lata. *Spadix foemineus* fructiferus tantum visus, cum pedunculo ancipiti 5 cm. longo secus margines armato 50 cm. longus. *Spathae* primariae ignotæ, spathellis perbrevibus annularibus apice liguliformibus. *Rami* primarii circ. 5, in spiculas alternantes ad 5 cm. longas divisi. *Involucrophorum* tri- vel quadrangulare, pedicelliforme, clavatum, 1 cm. longum. *Involucrum* 2–4 mm. longum, obconicum, apice truncatum ad 5 mm. in diam., vertice concavum; areola oblonga involucrophoro fere æquilonga. *Perianthium* fructiferum explanatum. *Fructus* oblongus, longe mucronulatus, sine mucrone 2–3 mm. alto circ. 20–22 mm. longus, 17–19 mm. in diam., squamis secus mediam canaliculatis, per series verticales 18–20 imbricatis, resina atro-purpurea vernicosis. *Semen* ovoideum, profunde ruminatum, 1.3 mm. longum, 1.2 mm. in diam.; embryo basilari.

SUMATRA: Bandar Baru on Gunong Sibayak (Nur 7308. Type in Singapore).

The photographic plate 45 in the *Calcutta Annals XII* represents a Sumatran plant collected by Forbes under n. 2287 and preserved in the Calcutta herbarium. Beccari has identified it as *D. propinquus*, from which it differs in several characters; for, to quote from my notes made of the duplicate preserved at Kew, the leaflets in it may be described as elliptic lanceolate, while in *D. propinquus* they are much longer (40–45 cm.), broader (2–3.5 cm.), ensiform, gradually narrowing towards the apex. The involucrophore in Forbes's specimen is much longer than in the type of *D. propinquus*. The outer spathe shows slender spines, solitary or in groups, mostly along the two dorsal carinae and margins, without any tendency to align themselves in transverse series, though they may be linked vertically by the fibres of the carinae and the margins. In Griffith's specimen referred here to *D. propinquus* the outer spathe is much more rigid and woody and has not any prominent dorsal carinae. Its spines too are often transversely digitate and coalesce sometimes to form interrupted horizontal series.

Forbes's specimen appears to belong to *D. confusus*, though owing to a great difference in the development between its spadix and that of the type of *D. confusus*, and also owing to the absence of the outer spathe in the latter, I cannot be sure of the determination. The leaflets and the armature on the petiole and the sheath agree very well with those in Nur's specimen. I did not have the latter with me at the time I made notes of Forbes's specimen, but looking at Beccari's plate, I note that the peduncle in that of Forbes is armed all round and with more spines, whereas in Nur's it is (very sparingly) armed only along the two margins. But such variations may sometimes be found even in one and the same species.

Blume's plate 132 in *Rumphia* (1845) appears to belong here, though Beccari (*op. cit.* p. 107) was inclined to regard it as the real *D. draco* (Willd.) Bl. According to Beccari's interpretation I take *D. draco* to be a species with small seriate bristles on the sheath (more or less as in *D. dracunculus* Ridl.) and short involucrophores (as in *D. propinquus*). Blume's plate 132 does not in any way satisfy these two conditions. The armature on the outer spathe in the plate appears moreover to be like the one in Forbes's specimen preserved in the Kew Herbarium.

6. *Dæmonorops didymophyllus* Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 468 et Calc. Ann. XII (1911) 123; Ridley in Journ. Roy. Asiat. Soc. Str. Br. (1900) 175, Mat. Fl. Mal. Pen. II (1907) 180 et Fl. Mal. Pen. V (1925) 41.

D. periacanthus Miq. *sensu* Merr. in Univ. Calif. Publ. Bot. XV (1929) 24 **syn. nov.**

MALAY PENINSULA: *Singapore*: Selitar (Ridley: in 1890; in 1892, vern. name *Rotang Udang*; in 1894 n. 6277); Chan Chu Kang (Ridley, 3476, v.n. *R. Udang*); Bukit Timah (Ridley: in 1892, v.n. *R. Butong*. "The poisonous rattan, used by the Sakais"; in 1895, v.n. *R. Getah*; and 5875 and 6672); Changi (Ridley 6273; Mat in 1894); Bukit Mandai (Ridley, 10437). *Johore*: Pulau Tinggi (Burkill, 928, v.n. *R. Tawa*); Sungei Pelapa (Nur, 20045); Gunong Banang (Ridley in Nov. 1900); Mt. Austin (Ridley in June 1904); Tanjong Kopang (Ridley, 6285). *Selangor*: Bukit Enggang (Symington, 24207, vern. n. *R. Kambong*); Kepong Plantations (Junas, 16403, vern. n. *R. Mantang*); Rawang (Ridley, 7885, vern. n. *R. Tahi Ayam*). *Pahang*: Tembeling (Henderson, 24532). *Kelantan*: Sungei Keteh at Batu Panjang (Nur with Foxworthy, 12113, v.n. *R. Saga*); *Perak*: Taiping Hills (Ridley in Feb. 1904); Maxwells Hill (Burkill & Haniff, 12681); Tapah (Burkill & Haniff, 13450); Jor (Haniff, 14231, Sakai name is *Gum Chebor*). *Penang*, Penang Hill (Ridley, 10345).

BORNEO: Tawao (Elmer 20482); Quop (Hewitt, in March 1908); Matang (Ridley in 1903, and n. 11823); Puah (Ridley, 12408).

In his *Flora*, Ridley has referred to *D. propinquus* Becc. the specimen collected by Burkill and Haniff at Tapah under n. 13450. Merrill *op. cit.* has referred Elmer's specimen to *D. periacanthus* Miq. with a proviso that it does not agree "particularly well" with Beccari's plates 88-89 given in the *Calcutta Annals* and that it "may prove to represent a distinct species". The Bornean specimens collected by Hewitt and Ridley show a great deal of variation from the type, but in the absence of better material I am averse to separate them into varieties. These variations incline me to regard *D. Motleyi* Becc. as a mere variety of *D. didymophyllus*.

7. *Dæmonorops Kunstleri* Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 469 et Calc. Ann. XII (1911) 151, t. 61; Ridl. Fl. Malay Pen. V (1925) 43.

D. elongatus Bl. *sensu* Ridl. Mat. Fl. Malay. Pen. II (1907) 185, in Journ. Roy. Asiat. Soc. Str. Br. 59 (1911) 215 et Fl. Mal. Pen. V (1925) 43. **syn. nov.**

MALAY PENINSULA: (a) *Fruit scales arranged in 15 vertical series*: Pahang, Sempadam, near Gap (Burn-Murdoch, 13297); Fraser's Hill (Holttum, 21526). Selangor, Bukit Kutu (Ridley in May 1896); Semangok (Ridley in Aug. 1904); Kwang (Ridley, 13451). Negri Sembilan, Bukit Tangga (Nur, 11853); Gunong Angsi (Nur, 11671). Johore, Temeoh River near Kota Tinggi (Ridley, 15361); Gunong Bechua (Holttum, 10839).

(b) *Scales in 15-17 series*. Kedah, Gunong Jerai = Kedah Peak (Ridley in June 1893). Penang, Penang Hill (Ridley, 10343); Balik Pulau (Ridley, 7905). Johore, Kuala Tebrau (Mat in June 1892); Gunong Belumut (Holttum, 10610; & 10748 ?); Kluang (Holttum, 9257). Singapore, Chan Chu Kang (Ridley in Oct. 1889); Bukit Mandai (Ridley in 1909); Bukit Timah (flrs., Ridley in 1894).

(c) *Fruit scales in 16-18 series*. Penang, Government Hill (Curtis, 2150); Mount Elvira (Haniff in April 1901). Perak, Larut Hills (Ridley in Dec. 1902). Pahang, Wray's Camp in Tahan (Ridley, 16291). Dindings, Bruas (Curtis Dec. 1903, v.n. Rotan Dudok). Johore, Mount Austen (Ridley in 1909). Singapore, Chan Chu Kang (Goodenough, 1667*); N. Seletar (Ridley in Dec. in 1890).

From the above classification of the specimens it will be readily seen that the species is very variable regarding the number of vertical rows into which the scales are arranged on the fruits.

Possibly this and *D. vagans* represent varieties of *D. elongatus* Bl., but the typical form of *D. elongatus* does not occur in the Malay Peninsula. Ridley's specimen n. 7905 collected at Balik Pulau in Penang was doubtfully referred by Beccari (*l.c.* 1911, p. 141) to *D. elongatus* and was said to have fruit-scales arranged in 18 vertical rows. A duplicate in the Singapore herbarium has its fruit-scales arranged only in 15-16 orthostichies. The lowermost spathe is also much smaller than in the typical *D. elongatus* and is like that of the typical *D. Kunstleri* though the leaflets are inequidistant in the terminal portion of the leaf; but this condition, I believe, is due to the fact that the cirrus is well developed as it often happens in many specimens of *D. Kunstleri*.

7A. *Var. langkawiensis* Furtado *var. nov.*

D. elongatus Bl. *sensu* Ridl. in Journ. Roy. Asiat. Soc. Str. Br. 59 (1911) 215; Ridl. Fl. Mal. Pen. V (1925) 43 quoad specimen ab Haniffio lectum.

* This number is also given to a specimen collected by Goodenough at Kranji. The spadix of this latter specimen is of *D. hystrix*.

A forma typica differt foliolis remotioribus, fructus squamis per orthostichos 20 dispositis.

MALAY PENINSULA: *Langkawi Island*, Gunong Raya (Haniff & Nur, 7119); Kesap (Haniff, 15911, v.n. Rotan Jeren); Burau (Ridley, 15884). On the last mentioned specimen is also mounted a spadix of *D. hystrix*.

8. *Dæmonorops lasiospathus* Furtado spec. nov.

D. scapigerus Becc. *sensu* Ridl. Flor. Malay. Pen. V (1925) 43 p.p. ?.

Caudex erectus, 0.5–1.5 m. altus, solitarius. Frondium *vagina* apice oblique truncata, haud gibbosa, fugaceo-leprosa, spinis applanatis gramineis, per series subparallelas obliquas confluentibus, 1–2.5 cm. longis armata. *Petiolus* 35–40 cm. longus, 8–12 mm. latus primum fusco-leprosus, dein glabrus, gramineus, supra applanatus basin versus late canaliculatus; dorso convexus; ad margines obtusas spinis ad 6 cm. longis, gramineis, applanatis, plerumque ternatis (digitis divaricatis, duobus dorsum versus enatis quam tertio multo brevioribus) armatus. *Lamina* metralis, plerumque cirrho carens vel in cirrhum filiformem ad 6 cm. longum terminata, unguibus simplicibus vel bifidis per series duas ad margines rhacheos dorsales prædita, in parte apicale sæpe carentibus. *Segmenta* plura, equidistantia, 2–3 cm. inter se remota, ensiformia vel lanceolato-lineraria, 25–30 cm. longa, 18–20 mm. lata, utrinque attenuata, in acumen longum oblique contracta, ad margines spinulosa, spinis apicem versus valde confertis; supra conspicue 3–costulata, viridia, secus costam mediam apicem versus tantum remote spinulosa, costis ceteris inermibus; subtus pallidiora, 5–leptoneura, ad totam costam medianam setulis inter se 2–4 mm. dissitis, ad costas ceteras setulis inter se 5–10 mm. vel magis remotis conspicue armata. *Spadices foeminei*: pedunculus magnitudine variabilis, 30–55 cm. longus, applanatus, biconvexus vel obscure triangularis, indumento ferrugineo deciduo obtectus, rarissime inermis, plerumque aculeis ad 2.5 cm. longis, solitariis vel digitatis, acicularibus vel applanatis, basin versus longioribus ac sparsioribus, superne minoribus ac magis confertis, interdum basi confluentibus armatus; *pars florifera* 5–15 cm. longa, in 3–5 ramos primarios floriferos vel spiculigeros, ad 5 cm. longos, indumento ferrugineo deciduo obtectos divisa. *Spiculæ* 10–15 mm. longæ, floribus 3–5 confertis. *Sapathæ: primariae* membranaceæ, exsuccosæ, scaphoideæ, ad 15 cm. longæ, post anthesin deciduæ, trichomis sericanis, ad 2 cm. longis, herbaceis, plus minusve appressis, per series transversales dispositis præditæ, inter quas indumento ferrugineo deciduo obtectæ; *secundariae* circ. 1 cm. longæ, inermes, fugaceo

tomentosæ, membranaceæ, basi amplexantes, apice acuminatissimæ. *Spathellae* annulares, oblique truncatæ vel in uno latere in ligulam triangularem productæ, basi tomentosæ. *Involucrophorum* sessile, cupuliforme, in spathella immersum vel paululo exsertum. *Involucrum* consimile. *Flores* 1 cm. longi; calyx 5 mm. longus, profunde tripartitus; corolla calyce duplo longior, fere ad basin tripartita, segmentis lanceolato triangularibus, coriaceis. *Perianthium fructiferum* explanatum, apice mox emoriens, basi 2-4 mm. longum, callosum. *Fructus* sphaerici vel globosi, 2.5 cm. in diam., in apiculum conicum ad 4 mm. longum abrupte terminati, squamis per series verticales 13-15 dispositis, basi gramineis, apicem versus atro-fuscis, secus margines conspicue atro-cinctis, dorso sulcatis. *Semen* cum integumento sicco ambitu oblongum, 17-19 mm. altum, 16-17 mm. crassum, utrinque truncatum, basi caudiculatum; sine integumento globoso ovoideum, obscure quadrangulare, 17-18 mm. altum, 15-17 mm. latum, 15-16 mm. crassum, basi rotundato-truncatum, apice paulo attenuatum, summo rotundatum. *Albumen* profunde ruminatum; parte centrale homogenea et alba circ. 5 mm. in diam. *Embryo* basilaris.

Planta mascula habitu ut foeminea, sed spadicum parte spiculigera spiculisque longioribus, pedunculo minus armato, floribus angustioribus differt. *Flores* 6-8 mm. longi, calyce 2-4 mm. longo, duplo brevior quam corolla.

MALAY PENINSULA: *Johore*, Sungei Kayu Ara, 12½ mile Mawai-Jemaluang Road, common in moist, shady forest along the river banks (Corner & Furtado, 29482-A, female plant. Type in Singapore; 29494, male plant); Ulu Kahang (Holtum, 10920).

BORNEO: Siul (Ridley, in Sept. 1905); Matang (Ridley, in July 1903 or 1905?).

This species is a very close ally of *D. scapigerus* Becc., but that is described to have spathes which are quite unarmed or smooth and leaflets which are larger and more distantly arranged on the leaf rachis and which moreover bear in their under surface bristles along the median costa only, the other ribs being quite bare. In *D. lasiospathus*, on the other hand, the primary spathes bear transverse rows of long, silky, soft herbaceous spines or hairs, and the three to five ribs, of the leaflets are conspicuously spinuliferous in the under surface.

The seeds in *D. lasiospathus* are globose-ovoid, provided with a broad superficial furrow that runs longitudinally from the base to the apex and then across the other side to the base. It is this furrow that gives the seeds an

appearance of being obscurely quadrangular. The mucilaginous coating of the seeds is rather thick when fresh and has acidulous pleasant taste. The fruit-scales vary considerably in colour; sometimes they are dark brown with a still darker line along the margins and a straw-coloured line at the base; at other times, or on other side of the same fruit, the scales are mostly yellowish or straw-coloured, the dark colour being restricted only to the apex and the margins.

I have seen only two male specimens (Corner & Furtado, 29494) and in both these the peduncles are considerably less spiny than in the female, though they do not exhibit any other character to separate them from the typical specimens. Hence I doubt the advisability in using the spininess of the peduncle as a basis for splitting the species of this group into varieties as Beccari has done in the case of *D. scapigerus* Becc. and its *var. minor* Becc. I have therefore included in the above citations Ridley's specimen (female) collected at Matang in Borneo, though its peduncle is quite unarmed.

I am not sure what specimen is referred by Ridley in his *Flora* to *D. scapigerus* Becc. The description given is mostly adapted from the one given by Beccari in the *Calcutta Annals XII*. The specimen is quoted thus: "Johore, Ulu Madik, (Holtum)". Now the Ulu Madik specimen is numbered 10636 and bears not the slightest resemblance to *D. scapigerus*, though in the Singapore herbarium it is marked to show that it is the basis for Ridley's record of *D. scapigerus* in the Malay Peninsula. It is a typical *D. periacanthus* Miq. At Ulu Kahang, a region not far distant from Ulu Madik, Holtum collected another specimen which is referred here to *D. lasiospathus* (cf. Holtum, 10920). Possibly Ridley had this second specimen in mind when he recorded *D. scapigerus* for the Peninsula.

9. *Dæmonorops longipedunculatus* Furtado spec. nov.

Caudex scandens vel semi-scandens, 1.5–5 m. longus, cum vagina 2.5 cm. in diam. *Fronde*s magnæ, cirrhiferae, subtus ad rhachin laminæ trigonam unguibus 3–5 fidis et ad cirrhum 5–7–fidis. *Vagina* in speciminibus visis haud gibbosa, allutacea, aculeis laminaribus, elasticis, solitariis vel interdum per series transversas interruptas confluentibus olivaceis vel nigricantibus, reflexis, ad 8 cm. longis, basi 4–6 mm. latis, majoribus et brevioribus immixtis, frequenter apicem versus longissimis, inferioribus latissimis et infimis

brevissimis armata. *Ochrea* perbrevis, spinulis acicularibus fusco-atris per series transversas aggregatis, ad 4 mm. longis ad marginem extus armata. *Petiolus* circ. 25–75 cm. longus; supra late canaliculatus vel applanatus, basin versus interdum aculeis rigidis solitariis vel confluentibus; subtus convexus, dorso aculeis solitariis rigidis, remotis; ad margines obtusus aculeis basin versus interdum laminaribus, elasticis, longioribus perpaucis, ad 5 cm. longis, brevioribus rigidis immixtis, apicem versus valde reductis armatus. *Segmenta* per greges approximata, gregibus alternantibus vel sub-oppositis ex segmentis 2–4 constatis, coriacea, elliptico-lanceolata, utrinque sensim vel abrupte attenuata, in apicem filiformem facile emorientem terminata, basi subito contracta; 5–7 plicatulo-costulata, 30–50 cm. longa, 2.5–4.5 cm. lata, supra saturate viridia, subtus pallidiora, secus costam mediam in parte terminali utrinque et remote aculeolata vel in uno latere inermia, ad margines aculeolis consimilibus sed brevioribus, apicem versus longioribus et magis confertis ciliata, venulis transversis plurimis utrinque conspicuis. *Spadix* foemineus longi-pedunculatus, paniculatus: pedunculo ad 1 m. longo ancipiti, inermi vel ad margines aculeis acicularibus perpaucis remotis prædito, decidue fusco-leproso; rhachi florifera circ. 40 cm. longa, in ramos 3–5 divisa; ramis ad axillam callosis, alternis, fugaceo fusco-tomentosis, 10–20 cm. longis, utrinsecus spiculas 4–6 ferentibus; spiculis sinuosis utrinsecus 5–6 fructus gerentibus, eodemmodo tomentosis. *Spathae* primariae ignotæ; spathellæ ut rhachis spicularum fusco-tomentosæ, annulares. *Involucrophorum* fructiferum, obconicum, pedicelliforme, obscure-angulare, 2–4 mm. longum, ad axillam conspicue callosum; involucrum in involucrophoro fere omnino immersum vel ad 1 mm. exsertum, patellæforme, integrum, orbiculare vel floris latus neutri versus magis productum, vertice cicatrulla orbiculari plus minusve tumida præditum; areola conspicua, altitudine sua latiore, cicatrulla tumescente. *Flores*: calyx floriferus urceolatus vel cyathiformis, apice obscure trifidus; corolla calyce duplo longior, segmentis longis mox emorientibus. *Perianthium* fructiferum manifesto pedicelliforme, in parte basilari cyathiforme, apice segmentis explanatis. *Fructus* oblongi, utrinque abrupte et rotundato contracti, cum perianthio ac rostello utroque 2–3 mm. alto circ. 20–25 mm. longi, 13–15 mm. in diam. *Squamæ* in orthostichis 15, rarius 16–17, dispositæ, medio sulcatæ, fusco-stramineæ, ad margines scariosæ, fascia intramarginali fusca vel leviter

purpurea (ad angulum inferiorem atriore) cinctæ. *Semen* oblongum, utrinque rotundatum, in uno latere applanatum, 15–17 mm. longum, 10–11 mm. latum, 9 mm. crassum; embryo basilari; albumine ruminato.

Planta mascula habitu sicut fœminea ut videtur. *Spadix* magnus et longi-pedunculatus; pedunculus anceps; rhachis ut in fœminea divisa et vestita. *Rami* primarii in ramos secundarios spiculas gerentes 3–4 divisi. *Spathae primariae* papyraceæ, exsuccæ, cinnamomeæ, extus indumento fusco fugaceo obtectæ, striatæ, inermes; externa longissima, circ. 30–40 cm. longa, bicarinata, apice sæpe fissa, acuminata. *Spiculae* 2–5 cm. longæ, porrectæ, sinuosæ, utrinsecus floribus bifariis 4–6 congestis. *Flores* 5 mm. longi; calyce tubuloso, cyathiforme, striato, obscure trifido; corolla striata, fere duplo longiore quam calyce, ad 2/3 in segmenta lanceolata divisa.

BRITISH NORTH BORNEO: Kinabalu Mountain Range: *Penibukan*, alt. 4,000–5,000 feet (Clemens: 31280, type in Singapore; 31280a; 30887; 31581; 50343; and 40754, male). *Gurulu Spur*, alt., circ. 5,000 feet (Clemens, 50547). *Dallas*, alt. 2,500–3,000 feet (Clemens: s.n. mature fruits but no leaves; 26793; 26807; 27156–a, male, no leaves; 27156; 27269).

The Dallas specimens have involucrephores distinctly longer than in the type and may prove to represent a distinct variety, but in the absence of better material I have refrained from giving them a varietal rank.

This species is very closely related to *D. virescens* from the Philippines and *D. longipes* from the Malay Peninsula and Malay Isles; but it is readily recognised from either of these by its distinctly grouped leaflets which have more-over their midribs (others are bare) sparingly spinulose in one or both surfaces, whereas in the other two species the leaflets are not distinctly grouped except perhaps in the lowermost and the uppermost part of the lamina. They (the leaflets) are also much more spinulose in the latter two species and often the side nerves (in *D. longipes* in the lower or both surfaces and in *D. virescens* in the upper surface only) also bear bristles. Perhaps *D. virescens* represent a link between *D. longipes* and *D. longipedunculatus*. I have noted that the leaflets are 5–7 nerved because I do not find any difference between subprimary and secondary nerves, though in nervation these leaflets cannot be easily distinguished from those of *D. longipes* except by their armature.

D. periacanthus Miq. resembles this species specially with regard to the grouping of the leaflets, but it has: a much shorter peduncle which is conspicuously spiny:

spherical fruits; leaflets with a midrib usually smooth or occasionally armed with a few bristles underneath the apex only; and a leaf-sheath armed with a much larger number of smaller spines and provided with a slight gibbosity below the petiole.

Forms actually much closer to *D. longipes* occur in Borneo as is evidenced by Elmer's no. 20840 collected at Tawao and listed by Merrill in *Univ. Calif. Publ. Bot.* XV, 1929, p. 24, without any specific epithet. Judging from the fragmentary material available in the Singapore herbarium, consisting of a portion of lamina and a pair of fruiting spikelets, I am inclined to think that this Elmer's specimen represents but a mere variety of *D. longipes* with smaller fruits having their scales arranged in 18 vertical rows. The leaflets seem to be inæquidistant and not distinctly grouped and their three costas are armed as in *D. longipes* with the exception that the two subprimary costas above are quite bare, a condition also found occasionally in the other species. Of the other parts which I have not seen, Merrill gives the following description: "The leaves about 3 m. long, flagellate [cirrate], the flattened spiny petiole about 1 m. in length, the spines on the basal sheathing parts flat, nearly black, 5 cm. long, arranged in transverse rows. Infructescences 45 cm. long, pendent, flattened green peduncles 60-90 cm. in length." Perhaps Merrill had no fruits and sufficient leaflets in the specimens examined by him, for he notes that "the material available for study is not sufficient for further identification".

10. *Dæmonorops micracanthus* (Griff.) Becc. in Hook. f. *Fl. Brit. Ind.* VI (1893) 467 et in *Calc. Ann.* XII (1911) 110 pl. 43; *Ridl. Mat. Fl. Mal. Pen.* II (1907) 180 et *Fl. Mal. Pen.* V (1925) 41 pp.

Calamus micracanthus Griff. in *Calc. Journ. Nat. Hist.* V (1844) 62 et *Palms Brit. Ind.* (1850) 72; *Mart. Hist. Nat. Palm.* III (1849) 339.

D. draconcellus Becc., *Nelle Foreste di Borneo* (1902) 324, 590, 608 et in *Calc. Ann.* XII (1911) 108 pl. 42; *Merr. Bibliogr. Enum. Bornean Pl.* (1921) 78. **syn. nov.**

D. propinquus Becc. *sensu* *Ridl. Mat. Fl. Mal. Pen.* II (1907) 181 et *Fl. Mal. Pen.* V (1925) 41 pp. **syn. nov.**

MALAY PENINSULA: *Kemaman* (Vaughan-Stevens in 1890). *Kedah:* Sungei Petani (Forest Dept. Coll. 10209 in herb. Kepong); Baling (Babjee, 10168 in Herb. Kepong). *Pahang:* Gunong Lesong (Lambak, 10006 in herb. Kepong); Sungei Lepar (Smith 6701 in herb. Kepong. *Negri Sembilan:* Palong Gemas (Hamid, 6380); Kuala Pilah (Moorhouse in 1904, sterile; in 1908, fertile); Bukit

Senaling (Moorhouse in 1903). *Malacca*: (Griffith, sterile, in Kew Herb. *Type*). *Johore*: Johore Lama (= Panchur) (Ridley, 10952, v.n. *Tai Ayam*, sterile). *Singapore*: Bukit Timah (Ridley in 1900, sterile).

BORNEO: Kuching at the foot of Gunong Matang (Beccari, 3644. Type of *D. draconcellus*; only its photographic plate above referred seen).

Here may also belong the following Peninsular specimens: *Selangor*: Kuala Lumpur, at Istagoh (Ridley, in June 1890). *Singapore*: Seletar, (Ridley on 30 Oct. 1889).

The basis of *D. micracanthus* was a sterile (juvenile) specimen sent to Griffith from Malacca, while that of *D. draconcellus* a fertile specimen collected in Borneo. But more mature and complete specimens collected in the Peninsula leave no doubt that the two species are identical. The criniform bristles on the sheath are fugacious so that in the type of *D. draconcellus* they have not yet fallen off. When the plants are very young, the spines grow on small tubercles, but later on, as the plants develop, the tubercles tend to coalesce in interrupted horizontal or oblique series, giving thereby a wrinkled appearance to the sheath. The leaflets are often bristly in the three superior nerves, but in some cases only the midrib is sparingly armed; in the lower surface the bristles appear to be mostly deciduous so that sometimes only a few bristles remain on the midrib and at times a few are also found on the two side nerves. The perianth is explanate in the fruit with a short circular callus at the base. The fruit scales are arranged in 18-21 vertical series. The spadix is covered with a deciduous rusty brown indumentum. The very narrow leaflets, the length of the involucrophore (3-5 mm. long), the callus or perianth ring persisting on the fruits and the rusty brown indumentum on the spadices distinguish this at once from all the other "dragon-blood" producing species in the Peninsula.

Ridley's description of the fruits and spadix, which is framed in mistaken terms, was derived apparently from a specimen collected by him at Bukit Timah in Singapore, sub n. 10783, and cited by him in the *Materials* and his *Flora*. The spathe, spadix and fruits in this specimen are evidently of *D. didymophyllus*, while the leaf is of quite different species (possibly *D. angustifolius*).

The two specimens which I have doubtfully referred here and the one from Kemaman (this last consist of a fruiting spadix only) have been cited by Ridley in his works under *D. propinquus*. The first two specimens have leaflets which are apparently of *D. micracanthus*, with male

spadices resembling those of *D. brachystachys*. The only difference that one notices in the leaflets is that the lower surface of the midribs is more distantly aculeolate than in the female specimens. The spathes, though very powerfully armed, are easily distinguished from those of *D. propinquus* (as figured by Griffith) by their spines which are distinctly digitate in the latter.

With the exceptions noted above, almost all the other collectors have recorded that this species is *Rotang Jernang*—a name which Malays apply rather indiscriminately to all the species yielding “dragon-blood”. This species yields perhaps the best “dragon-blood” in the Peninsula.

11. *Dæmonorops oligophyllus* Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 470 et in Calc. Ann. XII (1911) 182 pl. 78.

D. sabut Becc. *sensu* Ridl. Fl. Malay Pen. V (1925) 27 tantum quoad synonym. **Syn. nov.**

Ridley considers the type of this species to be but a younger shoot of *D. sabut*. If both these binomials are conspecific, then their characters are certainly not a result of merely age but of ecological differentiations; for, apart from the distinguishing differences noticed by Beccari, it is to be noted that the leaves of *D. oligophyllus*, though bear smaller leaflets, are provided with much longer cirrus than in the type of *D. sabut*., whereas in younger forms one ought to have expected still shorter cirrus. Hence in the absence of conclusive evidences to unite the two species, I think it is better to maintain them as distinct. A specimen of what appears to be *D. sabut* was collected by Ridley in Johore at Castlewood in June 1909. It bears a longer cirrus than in the type specimen, but otherwise agrees well with the description and plate given by Beccari (*Calc. Ann. XII, 1911, p. 181 pl. 77*).

12. *Dæmonorops propinquus* Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 467 et Calc. Ann. XII (1911) 111 p.p. et pl. 44; Ridl., Fl. Malay Pen. II (1907) 181 et Fl. Mal. Pen. V (1925) 41 p.p.

Calamus draco Willd. *sensu* Griff. in Calc. Journ. Nat. Hist. V (1844) 65 p.p. et Palms Brit. Ind. (1850) 75 quoad sepecimina in pl. 201 A & B delineata.

D. draco Bl. *sensu* Mart. Hist. Nat. Palm. III, 2nd. Ed. (1849) 205 p.p.

MALAY PENINSULA: *Malacca?* (Griffith, n. 83, developed spadix in Herb. Kew, subject of Griffith's plate 201-B. lecto-Type.; Griffith, unopened spadix with spathes, subject of plate 201-A). *Perak*, loc. incert., (Scortechini in herb.

Beccari, not seen, figured in the plate 44). *Selangor*: Ayer Kuning (Omar, 9933, vern. name *R. Jernang*); Sungei Buloh (Omar, 9916, v.n. *R. Jernang*, fruits used for dyeing purposes, in Herb. Kepong). *Pahang*, Plangai (Burkill & Haniff, 16792, as *R. Jernang*, fruit eaten and medicine made from it).

Beccari's *D. propinquus* is a *mixtum compositum*. Having satisfied himself that the fruiting spadix in Scortechini's specimens belonged to the same species as the one figured by Griffith in the pl. 201. B, he wished to make its description as complete as possible. The difficulty arose when he regarded Forbes's specimen n. 2287 to be conspecific with Scortechini's; and as the leaflets in Forbes's specimen were somewhat different from those in Scortechini's, strangely enough he concluded that the leaflets in the latter specimen did not belong to the same species as the fruits, at least that is the information recorded in a note by Hooker who edited Beccari's manuscript work on the Palms in the *Flora of the British India*. It is possible that Hooker was mistaken in this statement, for the leaflets in Scortechini's specimen as depicted by Beccari in the plate 44 published in the *Calcutta Annals* has leaflets not 5 cm. broad as stated by Hooker in his note, but only 2.5–3 cm. (as in Omar's 9933) as stated by Beccari in the *Calcutta Annals* XII (1911) p. 112. Besides, Scortechini's collection of this species is not represented in the Kew herbarium and there is instead a specimen collected by Wray sub. n. 3358 (referred by me to *D. brachystachys*), which has leaflets as broad and long as the ones described in the note of Hooker and which bears a slip with information written by Dr. (later Sir) David Prain, then of the Calcutta herbarium, to state that Beccari authenticated the fruits to be exactly as in the type (?) of *D. propinquus* but doubted as to the leaflets belonging to same species or the plant as the fruits. This Wray's specimen is not cited in Hooker's *Flora*, nor in the *Calcutta Annals*. Ridley quoted this specimen under *D. propinquus* in his *Materials II* (1907) 181, but omitted it in the *Flora* (1925).

The Pahang specimen cited above consists only of a spadix with young fruits, but without its peduncle or spathes.

For the principal differences between this and *D. confusus* or *D. brachystachys*, see my observations under the latter two species. As the leaf-sheath of *D. propinquus* is not yet known, its exact affinities remain still doubtful. The leaflets are like those of *D. gracilipes*.

The exact locality whence Griffith obtained each of the two spadices figured as *C. draco* in the *Palms Brit. Ind. pl. 201 A & B* is very doubtful. Griffith himself does not record the information on the sheets themselves, probably because *C. draco*, as understood by him, was widely distributed throughout the Malay Islands. But from the fact that Griffith adds to the particulars given under the habitat in Roxburgh's *Flora Indica** the following: "Penang, Mr. Lewes. *Jarnang* of the Malays of Penang", one would think that Penang was the place of origin of the spadices and that Lewis was their collector. But the words "Penang, Mr. Lewes" are deleted entirely in Griffith's second account, and instead "according to Mr. Lewis it is the" are inserted. This and the way Hooker has cited the specimens from Griffith's herbarium in the *Flora* suggests that only a part of them was collected by Lewis, while the other part was collected by Griffith himself or by his collector. Hooker however gives Penang as the place of origin for both these collections, while Ridley in the *Materials II* (1907) 182 gives Malacca and Penang.

In 1933 I had an opportunity to examine Griffith's herbarium in Kew, but as at the time the problem about the exact localities had not presented itself to me, I did not pay any special attention to search for any clues on the sheets that would help me to solve this question; but the notes I made at the time regarding the structure of the spadix and fruits state that the spadix mounted on the sheet No. 83 is the same as the one figured in the plate 201 B, but with all fruits fallen off. In the capsule mounted on this same sheet there are scales coverings and seeds of quite immature fruits mixed with some mature seeds. Obviously the scale coverings and younger seeds do not belong to the spadix which is represented in the above mentioned plate as having much larger and more mature fruits. The scale coverings are in a bad state of preservation, but still in three instances I was able to note that the scales were arranged in 13-15 orthostichies, a fact which suggests that the small fruits belong to *D. didymophyllus*; for this is the only dragon-blood-yielding *Daemonorops* in the Peninsula having its fruit scales arranged in so few series. But the latter is never known to produce so large and so diffuse a spadix as the one depicted by Griffith; in fact the spadix on the specimen in question and the fruits depicted by Griffith agree very well with the spadix and fruits figured by Beccari in the above quoted plate 44 of *D. propinquus*. But as this last (*D. propinquus*) produces fruits having scales

* The particulars recorded under the habitat in Roxburgh's *Flora Indica* run thus: "A native of Sumatra and the Malay Islands. Flowering time March and April."

arranged usually in 17-19 vertical series and never in less than 15, and that, unlike *D. didymophyllus*, it has not been found in Penang, one is inclined to suspect that the fruits on the sheet n. 83 had come from Mr. Lewis from Penang and that Griffith, or someone else, mounted them on the same sheet together with the other specimen collected by Griffith or his collector, apparently on the mistaken belief that they both belonged to one and the same species, if not to the same plant. Griffith himself had collected herbarium material in Malacca and later had maintained a collector there, and so it is not unlikely that the two specimens figured in the above quoted plates 201 A & B had come from Malacca. It is true also that *D. propinquus*, as interpreted here, is not represented in any other herbarium collections made in Malacca Settlement, but it has been found in the neighbouring state of Selangor.

Ridley in his *Flora* cited under *D. propinquus* a specimen collected by [Nur with] Foxworthy at Batu Papan on the banks of Sungei Keteh in Kelantan; but of the two *Daemonorops* from this collection labelled by Ridley as *D. propinquus* in the Kew herbarium, one is definitely *D. didymophyllus* and the other represents *D. brachystachys*. *D. propinquus* Becc. *sensu* Ridley in *Journ. Roy. Asiat. Soc. Str. Br.* 33 (1900) 175 is *D. leptopus* Mart., at least for the greater part of the specimens quoted.

13. *Dæmonorops pseudomirabilis* Becc. var. *malayanus* Furtado var. nov.

D. periacanthus Miq. *sensu* Ridl. Mat. Fl. Malay. Pen. II (1907) 185 quoad specimen apud Chan Chu Kang lectum. *Syn. nov.*

D. pseudomirabilis Becc.? in Calc. Ann. XII (1911) 179, pl. 74. *syn. nov.*

D. setigerus Ridl. Fl. Mal. Pen. V (1925) 45 quoad specimen apud Chan Chu Kang lectum. *syn. nov.*

A forma typica differt folioli costis utrinque lævibus; spadiceis pedunculo ad margines obtusas aculeis vel tuberculis spiniferis præditi; spiculis minoribus (6-7 cm. longis); fructus squamis concoloris, badio-gramineis.

MALAY PENINSULA: *Singapore*, loc. incert. (Ridley, 3515. Type in Singapore; and 3507, v.n. Rotan Chochor); Chan Chu Kang (Ridley 3493). *Johore*, Gunong Pulai (Goodall, in April 1921).

D. pseudomirabilis Becc. was based on a specimen derived from a plant cultivated in the Botanic Gardens, Buitenzorg, where it was said to have been introduced from

Palembang. A duplicate specimen of the type of the variety here described was doubtfully referred to the species by Beccari with the remarks that he was not sure of the plant as represented by the specimen being wild in Singapore. Though Ridley omitted any reference to this species in his *Flora V*, I think I am justified in deducing from the manner Ridley labelled his collections in the Singapore herbarium that both the above cited specimens bearing no definite locality on their labels were derived from wild plants. Besides there is the evidence of the Chan Chu Kang and the Gunong Pulai specimens that the variety is really wild in the Peninsula.

The leaflets in this variety are not arranged in very distinct groups and though the lowermost 6-7 leaflets are approximate into a distinct group with 3-4 divergent leaflets on each side of the rachis, the upper leaflets are porrect (not divergent) and irregularly scattered, occasionally two leaflets coming very close together. The total number of leaflets as counted in one leaf (Ridley's n. 3493) are 18-20 on each side of the rachis. The outermost spathe is cymbiform abruptly contracted at the apex and covered with deciduous acicular spines produced on transverse ridges or corrugations. At first sight the female spadix may be confused with that of *D. geniculatus*, but the involucrephores and involucre of the latter are hollow or cupuliform at the apex, whereas they are truncate with very little marginal rim in *D. pseudomirabilis* var. *malayanus*. In this respect the spikelets of the last mentioned resemble those of *D. longipes* in which, however, the fruits are much longer than broad, the leaflets more regularly arranged and the leaf-sheaths without any annular rings.

14. *Dæmonorops ruptilis* Becc. Calc. Ann. XII (1911) 211, t. 97.

Daemonorops sp. Merrill in Univ. Californ. Publ. Bot. XV (1929) 24.

BRITISH NORTH BORNEO: Tawao in Elphinstone Province (Elmer, 20484; 20825; and 21873).

Merrill makes the following remarks on these three specimens: "Not matched in Beccari Herbarium, nor can I refer it to any of the species figured by him; probably an undescribed species."

I have examined the duplicates bearing the above numbers in the Singapore herbarium and do not find any grounds to separate them from *D. ruptilis*, though Elmer's specimens represent a stage a little more developed than the type figured in the above-mentioned plate.

15. *Dæmonorops setigerus* Ridl. Fl. Malay. Pen. V (1925) 45.

In the *Materials II* (1907) 185 Ridley had referred to *D. periacanthus* Miq. some specimens, giving one, at the same time, to understand that he was not wholly in agreement with Martius and Beccari regarding their interpretations of *D. geniculatus* and *D. verticillaris*. Beccari (*Calc. Ann. XII*, 1911, pp. 169, 189 & 200) pointed out that there were evidences to show that it was Ridley, rather than he and Martius, who was confused over the species and that *D. periacanthus* Miq. as interpreted by Ridley could not be Miquel's species, Ridley's species being of the group which bears decussating, membranous, spiniferous collars around the leaf-sheaths. But Ridley was not satisfied with Beccari's explanations and so in his *Flora* he not only adhered to his previous views regarding *D. geniculatus* and *D. verticillaris* but published a new binomial, *D. setigerus*, to include *D. periacanthus* Miq. *sensu* Ridley [*Materials II*, (1907) 187].

An inquiry into these three species has shown me that Beccari's views on *D. geniculatus* and *D. verticillaris* are correct and that *D. setigerus* Ridl. is an illegal binomial being a *mixtum compositum*. In spite of a definite statement by Griffith to the contrary, Ridley took *D. geniculatus* to be a species with an unarmed peduncle to the spadix, so that every specimen of *D. geniculatus* he saw with an armed peduncle (at times it is unarmed) is included by him under *D. setigerus*. Then he mistook female or neuter spadices of *D. verticillaris* for the male and on this belief he has transferred to *D. setigerus* most of the male specimens of *D. verticillaris* at his disposal and on this mixture he has based his description of *D. setigerus*. No doubt he has included in his citations a specimen which I have referred to *D. pseudomirabilis* var. *malayanus* (described above), but the specific description does not in any way apply to it. The specimens quoted by Ridley under *D. setigerus* are as follows (I have not been able to trace two specimens cited under *D. setigerus*. Probably they are at Kew) :—

- (a) *D. VERTICILLARIS* (Griff.) Mart. *Malacca*, loc. incert. (Alvins, 1248, v.n. Rotan Gulang). *Pahang*, Kuala Lipis (Machado, 11632).
- (b) *D. GENICULATUS* (Griff.) Mart. *Malacca*, Bukit Sandanan (Derry, 959 v.n. Rotan Kerai); Gunong Miring on Ophir (Ridley in 1892). *Perak*, Assam Kumbang (Wray, 1922); Taiping Hills (Ridley, 11409); Bujong Malacca (Ridley 9813). *Pahang*, Tahan River, (Mat. in Sept. 1893).

(c) *D. PSEUDOMIRABILIS* var. *MALAYANUS* Furtado.
Singapore, Chan Chu Kang (Ridley, 3493).

In addition there are several specimens from Johore and Singapore which Ridley has determined as this species, though they belong to *D. Kunstleri* and *D. periacanthus*; but apparently they were not cited in his works. Among them is one collected by him on Mount Austen, where the Sungei Tebrau has its origin and this may be the Sungei Tebrau specimen quoted under *D. setigerus*. The specimen represents *D. Kunstleri*.

16. *Dæmonorops sparsiflorus* Becc. in Rec. Bot. Surv. Ind. II (1902) 224 et Calc. Ann. XII (1911) 126, pl. 102 quoad spiculas floriferentes.

BRITISH NORTH BORNEO: *Bole River*, alt. 700 feet (Keith, 4325); *Kinabalu Mountain Range*: Dallas alt. 2,000–3,000 feet (Clemens 26888; 27012; 27216); Paluan near Koung, alt. 1,500 feet (Carr 27377).

Keith's and Carr's specimens are male. Carr's specimen has spathes which are distinguished from the male of *D. sparsiflorus* var. *sarawakensis* Becc. by the fewer and much shorter, or rudimentary, bristles on the outside of their apex. The flowers in both the male specimens are somewhat spiral, or distichous in some parts and have a longer (up to 2 mm. long) distinctly pedicelliform involucrophore. The fruits in Clemens's specimens are very young, but they are sufficiently developed to show that the scales are arranged in 15 vertical rows. The involucrophore of the fruits is 5–7 mm. long, whereas in the var. *sarawakensis* it is only 3–4 mm. long even in fully developed fruits.

The species itself was based on a female specimen in flowers and owing to its apparent affinities to *D. draco*, Beccari had placed it among the *RESINIFERÆ*, and, though later Beccari described fruiting specimens of one of its varieties (*Calc. Ann. XII, 1911, p. 221*), he has not made any statement to show that the species and its variety are in fact non-resiniferous.

The species appears to be endemic in Borneo. No doubt the type of the species is Lobb's specimen said to have been collected in Labuan; but Lobb's specimens often bear incorrect localities.

16-A. *Var. sarawakensis* Becc. in Calc. Ann. XII (1911) 221 pl. 101 & 102.

BORNEO: Loc. incert. (Hewitt, v.n. Empunot); Kuching (Hewitt); Quop (Hewitt, n. P. 2, v.n. Rotan Landak); Gat near Upper Rejang River (Clemens 22089); Bau (Ridley 11824); Baram (Hewitt, n. R.E.).

In addition to its female flowers being distichously set, this variety, as pointed out above, differs from the type by the presence of many and much longer bristles at the apex of its primary spathes and by its shorter involucrephores in both the male and the female spadices. Apparently this form is more widely distributed than the type.

17. *Dæmonorops vagans* Becc. in Hook. f. Fl. Brit. Ind. VI (1893) 469 et in Calc. Ann. XII (1911) 153, t. 62; Ridl. Fl. Malay Pen. V (1925) 43.

D. periacanthus Miq. *sensu* Ridley in Journ. F.M.S. Mus. IV (1909) 87. **syn. nov.**

MALAY PENINSULA: *Perak*, Maxwell's Hill (Burkill & Haniff, 12646; 12716; 13192 & 13196); Taiping Hills (Fox in 1899). *Pahang*, Sungei Lemoi (Jaamat 28190, v.n. *Rotan Kerei*); Telom Ridge (Ridley, 13915).

The only character that distinguishes this species in herbarium from *D. Kunstleri* is the gibbosity on the petiole. As to the fruit-scales, only Fox's specimen was noticed to have them exactly in 15 longitudinal series. Burkill & Haniff's 13192 has flowers only and so the number of vertical series in which the fruit-scales are arranged could not be ascertained. The fruits in Burkill & Haniff n. 13196 have the scales arranged in 15-17 series, while those of the other specimens have 18 series. The leaflets of this are usually narrower than in *D. Kunstleri*, but occasionally one comes across specimens of the latter species having similar, narrow leaflets. It has to be ascertained whether *D. vagans* represents only a form of *D. Kunstleri* at a very advanced age when, owing to the length of its stem, will have to depend more and more on the neighbouring trees for keeping itself erect. Such a condition may in the end contribute to the production of a gibbosity at the base of its petioles. Petioles with and without such gibbosity are described in *D. elongatus*.

I have not seen the Bornean specimen cited by Beccari (*l.c.* 1911, p. 153). Possibly it is a variety of *D. elongatus*.